This key should allow you to understand why you choose the option you did (beyond just getting a question right or wrong). More instructions on how to use this key can be found here.

If you have a suggestion to make the keys better, please fill out the short survey here.

Note: This key is auto-generated and may contain issues and/or errors. The keys are reviewed after each exam to ensure grading is done accurately. If there are issues (like duplicate options), they are noted in the offline gradebook. The keys are a work-in-progress to give students as many resources to improve as possible.

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1. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{169}{0}} + \sqrt{60}i$$

The solution is Not a Complex Number, which is option B.

A. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

B. Not a Complex Number

* This is the correct option!

C. Pure Imaginary

This is a Complex number $(a + bi)$ that **only** has an imaginary part like $2i$.

D. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3 + 5)

E. Nonreal Complex

This is a Complex number $(a + bi)$ that is not Real (has i as part of the number).

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

---

2. Simplify the expression below and choose the interval the simplification is contained within.

$$8 - 1 \div 20 * 5 - (4 * 13)$$

The solution is -44.250, which is option D.

A. $[59.76, 60.65]$

59.990, which corresponds to not distributing addition and subtraction correctly.

B. $[48.71, 49.16]$

48.750, which corresponds to not distributing a negative correctly.

C. $[-44.2, -43.15]$

-44.010, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

D. $[-44.61, -44.11]$

* -44.250, which is the correct option.

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

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3. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(-6 - 2i)(8 - 9i)$$

The solution is $-66 + 38i$, which is option A.

A. $a \in [-70, -63]$ and $b \in [38, 47]$

* $-66 + 38i$, which is the correct option.

B. $a \in [-51, -47]$ and $b \in [17, 20]$

$-48 + 18i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

C. $a \in [-33, -26]$ and $b \in [-77, -66]$

$-30 - 70i$, which corresponds to adding a minus sign in the second term.

D. $a \in [-70, -63]$ and $b \in [-43, -36]$

$-66 - 38i$, which corresponds to adding a minus sign in both terms.

E. $a \in [-33, -26]$ and $b \in [68, 77]$

$-30 + 70i$, which corresponds to adding a minus sign in the first term.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

---

4. Simplify the expression below and choose the interval the simplification is contained within.

$$15 - 11^2 + 3 \div 10 * 7 \div 12$$

The solution is -105.825, which is option B.

A. $[135.9, 136.06]$

136.004, which corresponds to two Order of Operations errors.

B. $[-105.89, -105.76]$

* -105.825, this is the correct option

C. $[-106.13, -105.98]$

-105.996, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

D. $[136.12, 136.33]$

136.175, which corresponds to an Order of Operations error: multiplying by negative before squaring. For example: $(-3)^2 \neq -3^2$

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

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5. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{0}{484}} + \sqrt{10}i$$

The solution is Pure Imaginary, which is option E.

A. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3 + 5)

B. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

C. Nonreal Complex

This is a Complex number ($a + bi$) that is not Real (has i as part of the number).

D. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

E. Pure Imaginary

* This is the correct option!

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

---

6. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{63 + 33i}{8 - 5i}$$

The solution is $3.81 + 6.51i$, which is option B.

A. $a \in [7.45, 7.55]$ and $b \in [-1, 0]$

$7.52 - 0.57i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

B. $a \in [3.7, 4.4]$ and $b \in [5.5, 7.5]$

* $3.81 + 6.51i$, which is the correct option.

C. $a \in [3.7, 4.4]$ and $b \in [578.5, 580.5]$

$3.81 + 579.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

D. $a \in [7.85, 7.95]$ and $b \in [-7, -6]$

$7.88 - 6.60i$, which corresponds to just dividing the first term by the first term and the second by the second.

E. $a \in [338.9, 339.05]$ and $b \in [5.5, 7.5]$

$339.00 + 6.51i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

---

7. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(2 - 5i)(-9 + 3i)$$

The solution is $-3 + 51i$, which is option D.

A. $a \in [-5, 4]$ and $b \in [-56, -44]$

$-3 - 51i$, which corresponds to adding a minus sign in both terms.

B. $a \in [-22, -15]$ and $b \in [-17, -13]$

$-18 - 15i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

C. $a \in [-35, -31]$ and $b \in [38, 47]$

$-33 + 39i$, which corresponds to adding a minus sign in the second term.

D. $a \in [-5, 4]$ and $b \in [49, 52]$

* $-3 + 51i$, which is the correct option.

E. $a \in [-35, -31]$ and $b \in [-46, -31]$

$-33 - 39i$, which corresponds to adding a minus sign in the first term.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

---

8. Choose the **smallest** set of Real numbers that the number below belongs to.

$$-\sqrt{\frac{15}{0}}$$

The solution is Not a Real number, which is option A.

A. Not a Real number

* This is the correct option!

B. Irrational

These cannot be written as a fraction of Integers.

C. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

D. Integer

These are the negative and positive counting numbers (..., -3, -2, -1, 0, 1, 2, 3, ...)

E. Whole

These are the counting numbers with 0 (0, 1, 2, 3, ...)

General Comment: First, you **NEED** to simplify the expression. This question simplifies to $-\sqrt{\frac{15}{0}}$.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

---

9. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{-54 + 88i}{7 + 5i}$$

The solution is $0.84 + 11.97i$, which is option E.

A. $a \in [0, 1]$ and $b \in [884.5, 886.5]$

$0.84 + 886.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

B. $a \in [-9, -7]$ and $b \in [16.5, 18]$

$-7.71 + 17.60i$, which corresponds to just dividing the first term by the first term and the second by the second.

C. $a \in [-12, -10.5]$ and $b \in [4, 6]$

$-11.05 + 4.68i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

D. $a \in [60.5, 63]$ and $b \in [11, 13]$

$62.00 + 11.97i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

E. $a \in [0, 1]$ and $b \in [11, 13]$

* $0.84 + 11.97i$, which is the correct option.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

---

10. Choose the **smallest** set of Real numbers that the number below belongs to.

$$\sqrt{\frac{1760}{10}}$$

The solution is Irrational, which is option C.

A. Integer

These are the negative and positive counting numbers (..., -3, -2, -1, 0, 1, 2, 3, ...)

B. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

C. Irrational

* This is the correct option!

D. Whole

These are the counting numbers with 0 (0, 1, 2, 3, ...)

E. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

General Comment: First, you **NEED** to simplify the expression. This question simplifies to $\sqrt{176}$.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

---

11. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{-2380}{0}} + \sqrt{63}$$

The solution is Not a Complex Number, which is option B.

A. Nonreal Complex

This is a Complex number $(a + bi)$ that is not Real (has i as part of the number).

B. Not a Complex Number

* This is the correct option!

C. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3 + 5)

D. Pure Imaginary

This is a Complex number $(a + bi)$ that **only** has an imaginary part like $2i$.

E. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

---

12. Simplify the expression below and choose the interval the simplification is contained within.

$$1 - 2 \div 9 * 20 - (5 * 15)$$

The solution is -78.444, which is option D.

A. $[-75.01, -72.01]$

-74.011, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

B. $[-126.67, -123.67]$

-126.667, which corresponds to not distributing a negative correctly.

C. $[71.99, 82.99]$

75.989, which corresponds to not distributing addition and subtraction correctly.

D. $[-83.44, -77.44]$

* -78.444, which is the correct option.

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

---

13. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(5 - 2i)(8 + 10i)$$

The solution is $60 + 34i$, which is option B.

A. $a \in [59, 63]$ and $b \in [-40, -32]$

$60 - 34i$, which corresponds to adding a minus sign in both terms.

B. $a \in [59, 63]$ and $b \in [31, 37]$

* $60 + 34i$, which is the correct option.

C. $a \in [15, 22]$ and $b \in [65, 71]$

$20 + 66i$, which corresponds to adding a minus sign in the first term.

D. $a \in [39, 44]$ and $b \in [-21, -19]$

$40 - 20i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

E. $a \in [15, 22]$ and $b \in [-70, -57]$

$20 - 66i$, which corresponds to adding a minus sign in the second term.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

---

14. Simplify the expression below and choose the interval the simplification is contained within.

$$6 - 18^2 + 17 \div 11 * 5 \div 10$$

The solution is -317.227, which is option D.

A. $[-318.23, -317.26]$

-317.969, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

B. $[329.64, 330.72]$

330.031, which corresponds to two Order of Operations errors.

C. $[330.23, 331.02]$

330.773, which corresponds to an Order of Operations error: multiplying by negative before squaring. For example: $(-3)^2 \neq -3^2$

D. $[-317.26, -317.09]$

* -317.227, this is the correct option

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

---

15. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{1560}{8}} + 7i^2$$

The solution is Irrational, which is option E.

A. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3 + 5)

B. Nonreal Complex

This is a Complex number $(a + bi)$ that is not Real (has i as part of the number).

C. Pure Imaginary

This is a Complex number $(a + bi)$ that **only** has an imaginary part like $2i$.

D. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

E. Irrational

* This is the correct option!

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

---

16. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{63 + 44i}{6 + 5i}$$

The solution is $9.80 - 0.84i$, which is option C.

A. $a \in [1.9, 3.1]$ and $b \in [9, 11]$

$2.59 + 9.49i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

B. $a \in [9.6, 9.85]$ and $b \in [-51.5, -50]$

$9.80 - 51.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

C. $a \in [9.6, 9.85]$ and $b \in [-2.5, 0]$

* $9.80 - 0.84i$, which is the correct option.

D. $a \in [597.5, 598.55]$ and $b \in [-2.5, 0]$

$598.00 - 0.84i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

E. $a \in [10.25, 10.9]$ and $b \in [8, 9]$

$10.50 + 8.80i$, which corresponds to just dividing the first term by the first term and the second by the second.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

---

17. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(-3 - 10i)(8 + 5i)$$

The solution is $26 - 95i$, which is option B.

A. $a \in [23, 31]$ and $b \in [87, 103]$

$26 + 95i$, which corresponds to adding a minus sign in both terms.

B. $a \in [23, 31]$ and $b \in [-99, -90]$

* $26 - 95i$, which is the correct option.

C. $a \in [-74, -70]$ and $b \in [-69, -60]$

$-74 - 65i$, which corresponds to adding a minus sign in the second term.

D. $a \in [-26, -16]$ and $b \in [-50, -48]$

$-24 - 50i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

E. $a \in [-74, -70]$ and $b \in [64, 66]$

$-74 + 65i$, which corresponds to adding a minus sign in the first term.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

---

18. Choose the **smallest** set of Real numbers that the number below belongs to.

$$-\sqrt{\frac{8100}{25}}$$

The solution is Integer, which is option E.

A. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

B. Irrational

These cannot be written as a fraction of Integers.

C. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

D. Whole

These are the counting numbers with 0 (0, 1, 2, 3, ...)

E. Integer

* This is the correct option!

General Comment: First, you **NEED** to simplify the expression. This question simplifies to -90.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

---

19. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{27 + 44i}{-2 - i}$$

The solution is $-19.60 - 12.20i$, which is option B.

A. $a \in [-15, -13]$ and $b \in [-44.5, -43.5]$

$-13.50 - 44.00i$, which corresponds to just dividing the first term by the first term and the second by the second.

B. $a \in [-20.5, -17.5]$ and $b \in [-13, -11.5]$

* $-19.60 - 12.20i$, which is the correct option.

C. $a \in [-99, -97.5]$ and $b \in [-13, -11.5]$

$-98.00 - 12.20i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

D. $a \in [-20.5, -17.5]$ and $b \in [-62.5, -60]$

$-19.60 - 61.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

E. $a \in [-2.5, -1.5]$ and $b \in [-23.5, -22]$

$-2.00 - 23.00i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

---

20. Choose the **smallest** set of Real numbers that the number below belongs to.

$$\sqrt{\frac{40000}{100}}$$

The solution is Whole, which is option E.

A. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

B. Irrational

These cannot be written as a fraction of Integers.

C. Integer

These are the negative and positive counting numbers (..., -3, -2, -1, 0, 1, 2, 3, ...)

D. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

E. Whole

* This is the correct option!

General Comment: First, you **NEED** to simplify the expression. This question simplifies to 200.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

---

21. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{0}{144}} + \sqrt{4}i$$

The solution is Pure Imaginary, which is option D.

A. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3 + 5)

B. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

C. Nonreal Complex

This is a Complex number $(a + bi)$ that is not Real (has i as part of the number).

D. Pure Imaginary

* This is the correct option!

E. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

---

22. Simplify the expression below and choose the interval the simplification is contained within.

$$19 - 11^2 + 20 \div 7 * 13 \div 17$$

The solution is -99.815, which is option D.

A. $[141, 142.7]$

142.185, which corresponds to an Order of Operations error: multiplying by negative before squaring. For example: $(-3)^2 \neq -3^2$

B. $[-104.1, -101.6]$

-101.987, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

C. $[136.5, 141.4]$

140.013, which corresponds to two Order of Operations errors.

D. $[-100.3, -98.1]$

* -99.815, this is the correct option

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

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23. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(8 + 6i)(2 + 3i)$$

The solution is $-2 + 36i$, which is option E.

A. $a \in [-12, -1]$ and $b \in [-45, -33]$

$-2 - 36i$, which corresponds to adding a minus sign in both terms.

B. $a \in [33, 39]$ and $b \in [9, 15]$

$34 + 12i$, which corresponds to adding a minus sign in the first term.

C. $a \in [14, 21]$ and $b \in [17, 23]$

$16 + 18i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

D. $a \in [33, 39]$ and $b \in [-13, -3]$

$34 - 12i$, which corresponds to adding a minus sign in the second term.

E. $a \in [-12, -1]$ and $b \in [35, 40]$

* $-2 + 36i$, which is the correct option.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

---

24. Simplify the expression below and choose the interval the simplification is contained within.

$$19 - 9^2 + 8 \div 5 * 4 \div 20$$

The solution is -61.680, which is option A.

A. $[-61.93, -61.53]$

* -61.680, this is the correct option

B. $[100, 100.05]$

100.020, which corresponds to two Order of Operations errors.

C. $[-62.15, -61.94]$

-61.980, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

D. $[100.18, 100.45]$

100.320, which corresponds to an Order of Operations error: multiplying by negative before squaring. For example: $(-3)^2 \neq -3^2$

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

---

25. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\frac{\sqrt{65}}{18} + \sqrt{-2}i$$

The solution is Irrational, which is option E.

A. Nonreal Complex

This is a Complex number $(a + bi)$ that is not Real (has i as part of the number).

B. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

C. Pure Imaginary

This is a Complex number $(a + bi)$ that **only** has an imaginary part like $2i$.

D. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3 + 5)

E. Irrational

* This is the correct option!

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

---

26. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{-72 - 55i}{-7 + 3i}$$

The solution is $5.84 + 10.36i$, which is option E.

A. $a \in [11, 12]$ and $b \in [1.5, 3]$

$11.53 + 2.91i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

B. $a \in [4.5, 7.5]$ and $b \in [600.5, 602.5]$

$5.84 + 601.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

C. $a \in [338.5, 339.5]$ and $b \in [9.5, 12]$

$339.00 + 10.36i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

D. $a \in [10, 11.5]$ and $b \in [-19, -17.5]$

$10.29 - 18.33i$, which corresponds to just dividing the first term by the first term and the second by the second.

E. $a \in [4.5, 7.5]$ and $b \in [9.5, 12]$

* $5.84 + 10.36i$, which is the correct option.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

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27. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(3 - 10i)(-5 + 8i)$$

The solution is $65 + 74i$, which is option A.

A. $a \in [63, 66]$ and $b \in [72, 75]$

* $65 + 74i$, which is the correct option.

B. $a \in [-17, -12]$ and $b \in [-84, -79]$

$-15 - 80i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

C. $a \in [63, 66]$ and $b \in [-74, -69]$

$65 - 74i$, which corresponds to adding a minus sign in both terms.

D. $a \in [-102, -92]$ and $b \in [24, 29]$

$-95 + 26i$, which corresponds to adding a minus sign in the second term.

E. $a \in [-102, -92]$ and $b \in [-31, -22]$

$-95 - 26i$, which corresponds to adding a minus sign in the first term.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

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28. Choose the **smallest** set of Real numbers that the number below belongs to.

$$\sqrt{\frac{121}{324}}$$

The solution is Rational, which is option C.

A. Integer

These are the negative and positive counting numbers (..., -3, -2, -1, 0, 1, 2, 3, ...)

B. Whole

These are the counting numbers with 0 (0, 1, 2, 3, ...)

C. Rational

* This is the correct option!

D. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

E. Irrational

These cannot be written as a fraction of Integers.

General Comment: First, you **NEED** to simplify the expression. This question simplifies to $\frac{11}{18}$.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

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29. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{36 - 88i}{2 + i}$$

The solution is $-3.20 - 42.40i$, which is option D.

A. $a \in [17.5, 18.5]$ and $b \in [-89, -87]$

$18.00 - 88.00i$, which corresponds to just dividing the first term by the first term and the second by the second.

B. $a \in [-4.5, -2]$ and $b \in [-213, -211]$

$-3.20 - 212.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

C. $a \in [31, 33.5]$ and $b \in [-29.5, -27.5]$

$32.00 - 28.00i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

D. $a \in [-4.5, -2]$ and $b \in [-43, -41.5]$

* $-3.20 - 42.40i$, which is the correct option.

E. $a \in [-16.5, -15.5]$ and $b \in [-43, -41.5]$

$-16.00 - 42.40i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

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30. Choose the **smallest** set of Real numbers that the number below belongs to.

$$\sqrt{\frac{3600}{36}}$$

The solution is Whole, which is option B.

A. Irrational

These cannot be written as a fraction of Integers.

B. Whole

* This is the correct option!

C. Integer

These are the negative and positive counting numbers (..., -3, -2, -1, 0, 1, 2, 3, ...)

D. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

E. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

General Comment: First, you **NEED** to simplify the expression. This question simplifies to 60.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.
